had occurred in the Dakotas and Kansas. During the 28th the low area passed north of the Lake region with an apparent loss of energy, rain fell in the Lake region and upper Mississippi valley, and destructive wind and thunder storms occurred in Missouri in the evening. During the 29th the center of disturbance advanced to the lower Saint Lawrence valley, and the rain area contracted to the Atlantic coast.

VII.—Appeared north of Montana the evening of the 28th, with pressure below 29.60, and during the 29th moved eastward to Manitoba, with rain and thunder storms in the Missouri Valley. During the 30th this low area advanced to the Lake Superior region without evidence of marked energy. On that date rain and thunder storms were reported from Kansas over the Ohio Valley and the Carolinas. By the close of the month the storm-center had advanced to the middle Saint Lawrence valley, and an area of rain and thunder storms covered the middle and south Atlantic states, Tennessee, and Arkansas.

NORTH ATLANTIC STORMS FOR JULY, 1893.

[*Pressure in inches and millimeters; wind-force by Beaufort scale.*]

The paths of storms that appeared over the west part of the north Atlantic Ocean during July, 1893, are shown on Chart I. These paths have been determined from reports of observations by shipmasters received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Over the north Atlantic Ocean the July normal pressure is highest in an area extending over and southwest of the Azores, where it is above 30.20 (767). The normal values are lowest in an area covering the ocean between Iceland, Greenland, and Spitzbergen, where the normal pressure is below 29.70 (754).

In July there is usually an increase of pressure over the north Atlantic Ocean, except off the middle Atlantic and New England coasts and over eastern and extreme northern portions of the ocean. In regions where the normal pressure is higher than for the preceding month the increase is less than .05 inch. From the British Isles northward the normal readings are .05 to .10 inch higher than for June.

The storms of July advance eastward over the Atlantic Ocean at an average velocity of about 19 statute miles per hour. An average of 1.8 storm per month traverses the ocean from the American to the European coasts. The principal track of July storms is traced from Newfoundland to about north 55°, west 25°, where it divides, one branch passing northeastward to the coast of Norway and the other south of east over the British Isles and the continent of Europe.

Generally fair and settled weather prevailed over the north Atlantic Ocean during July, 1893. Three storms apparently crossed the ocean from coast to coast. One of these storms was central southwest of the Banks of Newfoundland at the opening of the month. During the 2d and 3d this storm moved slowly east-northeastward, and reached mid-ocean north of the 50th parallel on the 4th. Moving thence slowly eastward the storm-center passed north of the British Isles by the 8th. The pressure continued low over the British Isles from the 9th to the 11th, and during the 11th this storm apparently passed eastward over the continent of Europe. The second storm that traversed the ocean appeared off the New England coast on the 13th. By the morning of the 14th this storm had moved south of east to the 60th meridian, with pressure about 29.70 (754), and by the 15th had reached a position south of Newfoundland, with pressure about 29.60 (752). Moving northeastward with a decrease of energy the center of disturbance passed north of the region of observation after the 17th. On that date the storm was joined by low area IV, and reports indicate that the disturbance moved eastward in high latitudes and passed north of the British Isles during the 19th. The third storm that traversed the ocean was the severest of the month. This storm apparently passed eastward from the Gulf of Saint Lawrence on the 19th, reached a position north of the Banks of Newfoundland by the 21st, with pressure below 29.30 (744), increased in energy by the 22d, when the pressure fell below 29.20 (742) and gales of force 11 were reported between the 30th and 40th meridians, and passed thence eastward and disappeared north of the British Isles by the 25th.

A destructive whirlwind, crossed eastern Cuba the evening of the 6th. The storm struck the island at Santiago de Cuba, passed thence north of east to a point west of Baracoa, and there recurved and passed inside the north-northeast coast line to a point west of Banes, where it passed to sea. A schooner was wrecked off Santiago de Cuba, and in the district about Banes 10,000 acres of banana plants and property valued at $200,000 were destroyed. The storm reached Santiago de Cuba at 8.30 p. m. At that place the wind shifted from south-southeast to north-northeast, and blew with great fury. A destructive cyclone visited the Bay Islands, off the north coast of Honduras, Central America, July 6th, wrecking a number of vessels, and causing great loss of life and property.

On the 5th low area I occupied the Gulf of Saint Lawrence, and the morning of the 6th was apparently central between Cape Breton Island and Newfoundland. By the 7th the storm-center had passed southeast of Nova Scotia and had been joined by low area II, which had advanced south of east over Nova Scotia during the 6th. On the 8th this storm occupied the west portion of the Banks of Newfoundland, but possessed small strength, and on the 9th moved slowly northeastward along the east Newfoundland coast, where it was joined by low area III, which had passed eastward over the Saint Lawrence Valley during the 8th. By the morning of the 10th this storm had disappeared north of the Grand Banks. On the 20th a storm occupied the ocean northeast of the Banks of Newfoundland. By the 21st this storm had apparently united with a storm previously referred to as having passed eastward from the Gulf of Saint Lawrence during the 19th. The pressure continued low over Newfoundland and the Grand Banks until the 24th. During the 26th and 27th low area V passed north of east from the Saint Lawrence Valley to Labrador, and by the 27th this storm had disappeared north of the region of observation. Over the British Isles the pressure continued high from the 25th to the close of the month.

OCEAN FOG IN JULY.

The limits of fog-belts west of the 40th meridian, as reported by shipmasters, are shown on Chart I by dotted shading. About the usual amount of fog was reported. Near the Banks of Newfoundland fog was reported on 25 dates; between the 55th and 65th meridians on 17 dates; and west of the 65th meridian on 11 dates. Compared with the corresponding month of the last 5 years, the dates of occurrence of fog east of the 55th meridian numbered 1 less than the average; between the 55th and 65th meridians 2 less than the average; and west of the 65th meridian the same as the average. The fog noted by shipmasters and that reported by

observers of the Weather Bureau on the middle Atlantic and New England coasts generally attended the advance or passage of general storms.

OCEAN ICE IN JULY.

The limits of the region within which icebergs or field ice were reported for July, 1893, are shown on Chart I by ruled shading.

The southernmost ice reported, an iceberg on the 1st in the position given, was about 2° south of the average southern limit of ice for July, and, with the exception of ice noted in July, 1890, was the southernmost ice noted for July during the last 11 years. The easternmost ice reported, pieces of ice in the position given in the table, was about 1½° east of the average eastern limit of ice for July. The ice reported was well distributed over the Grand Banks, off the eastern coast of Newfoundland, and in and east of the Straits of Belle Isle.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for July during the last 11 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
July, 1883	42 42	49 57	July, 1883	46 47	45 44
July, 1884	46 24	50 02	July, 1884	48 36	46 28
July, 1885	42 14	48 30	July, 1885	48 00	44 00
July, 1886	42 59	49 18	July, 1886*	45 52	34 30
July, 1887	43 30	50 05	July, 1887	52 04	41 16
July, 1888	46 30	54 00	July, 1888	47 40	50 10
July, 1889	44 49	47 45	July, 1889	45 50	40 00
July, 1890	41 25	47 30	July, 1890†	50 08	38 45
July, 1891	43 16	49 45	July, 1891	47 02	48 00
July, 1892	43 04	50 17	July, 1892	48 00	44 40
July, 1893	41 40	50 08	July, 1893	46 10	42 20
Mean	43 33	49 29	Mean	47 50	43 51

*An iceberg and field ice.
†On the 10th a small piece of ice was reported in N. 48° 33′, W. 24° 11′.

TEMPERATURE OF THE AIR (expressed in degrees Fahrenheit).

The distribution of mean temperature over the United States and Canada for July, 1893, is exhibited on Chart II by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the temperature is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Weather Bureau represents the mean of the maximum and minimum temperatures.

The mean temperature was highest in the lower Colorado and Gila valleys, where it ranged from 90 to 95, and at points in the Colorado Desert, California, the mean readings were above 100. The mean temperature was above 85 over a large part of the interior of Texas, and was above 80 in the south Atlantic and Gulf states, along the Mississippi River as far north as Saint Louis, Mo., in the Southwestern States, and in the central valleys of California. The mean temperature was lowest in the lower Saint Lawrence valley, in western Nova Scotia and Alberta, in the mountains of Colorado, and along the immediate middle and north Pacific coasts, where it was 60, or below, and the mean readings were below 70 generally over New England and New York, the northern Lake region, northern Minnesota, northern North Dakota, and southward over the Rocky Mountain region to south-central New Mexico.

DEPARTURES FROM NORMAL TEMPERATURE.

The mean temperature was generally below the normal over the middle Atlantic and western New England states, and from the Pacific coast over the greater part of the plateau region. The mean values were slightly below the normal over the Florida Peninsula, and from the lower Missouri valley to the west Gulf coast. From the Lake region to the east Gulf and south Atlantic coasts, in the Canadian Maritime Provinces and Maine, from the northeast slope of the Rocky Mountains over the Saskatchewan and middle Missouri valleys, and on the southeast and middle-eastern slopes of the Rocky Mountains the month was somewhat warmer than usual. The most marked departure below the normal temperature was noted in the valley of the Columbia River and at San Francisco, Cal., where the mean readings were 3 below the normal. The greatest departure above the normal temperature, 3 to 4, was reported in Manitoba. At Havre, Mont., in the middle Ohio valley, eastern Tennessee, and at Dubuque, Iowa, the departure above the normal was 2 to 3.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for July for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for July, 1893; (4) the departure of the current month from the normal; (5) and the extreme monthly mean for July during the period of observation and the years of occurrence:

State and station.	(1) Normal for the month of July.	(2) Length of record.	(3) Mean for July, 1893.	(4) Departure from normal.	(5) Extreme monthly mean for July.			
					Highest.	Year.	Lowest.	Year.
	°	Years	°	°	°		°	
Arizona.								
Fort Apache	75·7	21	73·4	— 2.3	83·6	1877	70·3	1883
Fort Mohave	95·4	22	.....	.....	100·1	1873	90·1	1888
Whipple Barracks	75·2	22	70·5	— 4·7	81·7	1878	70·4	1883, 1891
Arkansas.								
Keesees Ferry	81·2	11	78·6	— 2.6	84·2	1888	75·2	1882
California.								
Fort Bidwell	71·4	22	67·2	— 4·2	75·9	1874	63·9	1884
Riverside	76·9	11	.....	.....	79·4	1883	73·1	1892
Colorado.								
Las Animas	75·7	10	75·0	— 0.7	79·1	1890	73·0	1891
Florida.								
Merritts Island	80.8	11	83.2	+ 2.4	83·2	1893	78·5	1886
Georgia.								
Forsyth	81.8	19	82.8	+ 1.0	85.7	1881	78·3	1882
Idaho.								
Boise Barracks	73·8	19	70·9	— 2.9	79.6	1873	69·4	1884
Fort Sherman	67·1	9	64·9	— 2.2	74·2	1889	62.6	1884
Indiana.								
Lafayette	73·4	11	77·7	+ 4·3	79·8	1887	69·0	1882
Indian Territory.								
Fort Supply	80·5	14	82.2	+ 1.7	85.8	1874	76·4	1891
Iowa.								
Cresco	70·8	20	71·1	+ 0.3	75·2	1874	65·1	1891
Kansas.								
Eureka Ranch	80·9	10	78·8	— 2.1	86.2	1890	76·3	1891
Independence	79·5	21	79·3	— 0.2	85·9	1879	74·7	1891
Salina	81·1	10	.....	.....	86·3	1890	76.2	1891
Louisiana.								
Grand Coteau	82.1	8	82.0	— 0.1	85.4	1884	79·0	1892
Maine.								
Orono	67·0	23	.....	.....	71·0	1887	64.2	1884
Maryland.								
Cumberland	72·1	22	75.2	+ 3·1	77·7	1889	70·3	1888
Michigan.								
Kalamazoo	72.2	16	73.8	+ 1.6	77·8	1885	67.2	1891
Missouri.								
Sedalia	78.4	13	79·0	+ 0.6	82.8	1888	71.2	1891
Montana.								
Fort Custer	70·7	11	73·5	+ 2.8	74.2	1890	67.8	1884
Nebraska.								
Fort Robinson	72·7	10	71.8	— 0.9	78·1	1886	66·9	1891
Genoa (near)	74·7	17	75·4	+ 0·7	78.6	1890	69.8	1891
Nevada.								
Browns	83·5	21	.....	.....	89·1	1873	79·4	1881
Carson City	71·3	15	65·5	— 5.8	73·7	1875	65·5	1893